# The Refrigeration Service Engineer



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No. 7

JULY • 1935

693

**The Universal Domestic Compressor • The Oil Separator • The Nizer-Kelvinator Pressure Control • Oil Return Hookup Chart**

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# *The* REFRIGERATION SERVICE ENGINEER

*Devoted to the Servicing of*
REFRIGERATION UNITS *and* OIL BURNERS

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# The Universal Domestic Compressor

## Description and Servicing of the Open-Type Rotary Compressor Manufactured by Landers, Frary and Clark, of New Britain, Conn.

OFTENTIMES, it is found that some manufacturers of mechanical refrigerators confine the major portion of their distribution to certain geographical locations. However, it is the intent of THE REFRIGERATION SERVICE ENGINEER to cover in its columns, design and servicing information on all machines, irrespective whether their distribution is national or otherwise. In fulfilling its service to this field, THE REFRIGERATION SERVICE ENGINEER is of the opinion that its readers are interested in securing as much information as possible on all makes manufactured or still in operation. These articles represent a most important source of servicing information.

This article is descriptive of the fourteenth machine covered in this series of articles. Each is compiled to be complete in itself. While some data covering certain servicing operations is a repetition of information published in previous issues in describing other machines, it has been considered of sufficient importance that the information on each machine be complete so that reference to other past issues by the reader will be unnecessary.

### Description of the Universal Domestic Refrigerator

Fig. 1 illustrates the cycle of operation of this refrigerating system. The 1935 line of this company consists of eight sizes of boxes, ranging from 4.1 cubic feet up to 8.1 cubic feet. The compressor is the open-type rotary Landers, Frary and Clark design, and the 4.1 to 6.0 cubic feet models are powered by a 1/6-hp. motor—the others by a ¼-hp. motor. The charge is 3¾ to 4¾ pounds of $SO_2$ and lubrication one pound. The controls are either Ranco or Cutler-Hammer automatic temperature controls with semi-automatic defroster. The evaporator is of the flooded-system type low-side float. The Landers, Frary and Clark compressor employs a forced-feed oiling system, the details of which are illustrated in Fig. 2.

The blade *A* sliding back and forth in the roll slot *B* acts as an oil pump. The port *C* leading to the oil case *D* is open for a short time, while the blade is withdrawing from the slot and the suction thus created draws oil into the slot. This port *D* is closed during that operation of the stroke wherein the blade practically fills the slot, forcing the

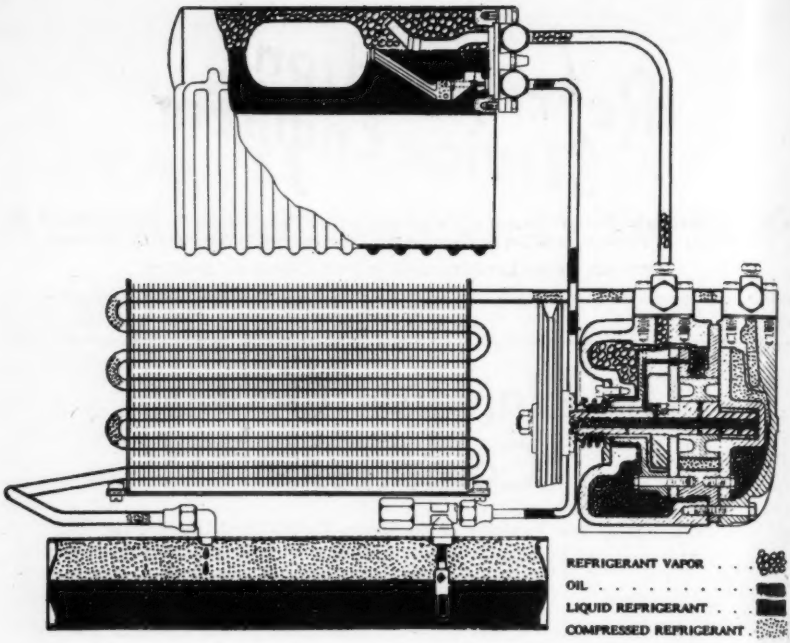



FIG. 1. CYCLE OF OPERATION OF UNIVERSAL DOMESTIC COMPRESSOR

oil out through ports *E* in the bottom of the slot again and into the shaft. The center of the shaft is hollow throughout its bearing length and the oil is fed from this hollow shaft through ports to all bearing surfaces. The pre-determined amount of oil is also fed up into the suction port *F* of the pump chamber during each revolution. To prevent the oil from building up too high a pressure in the hollow shaft, a relief port *G* opens into the bellows seal from whence the oil may flow back into the oil case *D*.

### The Compressor

The rotary Universal compressor is illustrated in the cut-away drawing shown in Fig. 5, illustrating the principal parts of the unit. The discharge and suction valves, Fig. 5 *A* and *AA* are the connections between the condenser and the suction line to cooling coil. These are both two-way shut-off valves of the standard design. The suction and discharge valves are fastened to the compressor body with cap screws and the gas-tight joint is formed by using three gaskets shown at *C* Fig 5. A lead gasket is placed on either side of the steel gasket to form a seal.

### The Pump Chamber

The pump operation of the Universal rotary compressor is illustrated in Fig. 6. It consists of the cylinder casing *A* containing the roll *B* mounted eccentric to the casing, a blade *C* and end plates illustrated in Fig. 5 as *G* and *H*. Again referring to Fig. 6, it will be seen that the crescent shaped cavity *K*, formed by the chamber walls and roll, progresses as the shaft rotates. The blade *C* acts as a dam and divides the space *A* into a low pressure and high pressure section. Thus, as the shaft rotates in a counter-clockwise direction, the gas located ahead of the point of contact between the roll and the pump chamber and the lower side of the blade is constantly be-

ing compressed into a rapidly diminishing space until the pressure in this space is greater than the pressure exerted on the check or flapper valve from within the chamber and is forced past the valve into the header cavity and then into the condenser. At the same time the gas is being compressed against the blade, a suction is being created on the opposite side because of the ever increasing size of this space. This causes gas to be drawn through the suction port into the pump chamber. Consequently, compression and suction occur simultaneously, and the even flow of power must be supplied with results of smoothness of operation and freedom from vibration. The roll and blade, due to their relative action, form the oil pump for the lubricating system. As the roll moves away from the blade and vacuum is created in the cavity form *D*, oil from the oil case is immediately sucked into the space. This action takes place on the first half of the revolution. On the second half of the revolution, the intake oil channels are shut off and as the oil pump cavity decreases, the oil is forced to the bearings. The oil case, Fig. 3 *F*, is a reservoir for the lubricating oil as well as the housing for the pump chamber. As the gas and oil are drawn from the suction line into the compressor body, they do not pass directly into the compression chamber, but enter the oil chamber where they are separated, the oil naturally falling to the bottom of the case and the gas being drawn into the suction port and thence into the compression chamber.

### The Seal Assembly

Fig. 7 is a diagram of the seal assembly.

The high lead bronze bearing ring is held firmly against the seal bearing plate by means of a spring. The bellows assembly is stationary. The seal plate turns with the shaft. The metal to metal contact keeps the seat and ring highly polished to produce a gas-tight seal. The pulley *N* is attached to the shaft *T* and secured by means of locking key *M*, lock washer *O* and nut *P*. The gasket *L* serves to maintain a gas-tight joint between the shaft and pulley. Surface oil from the compressor oiling system is exhausted through the shaft and into the bellows where it returns to the compressor oil case.

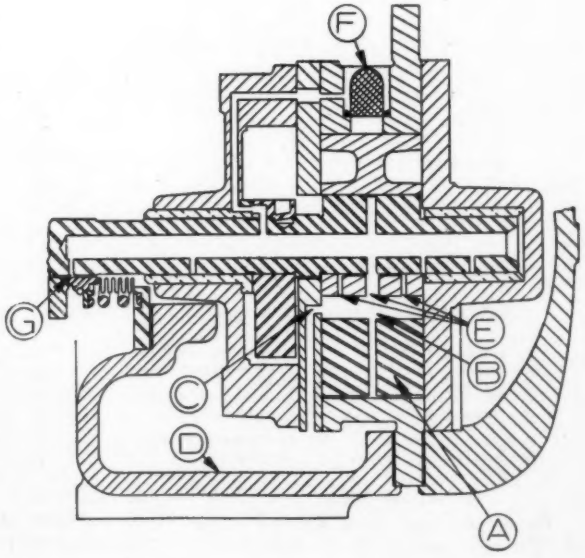
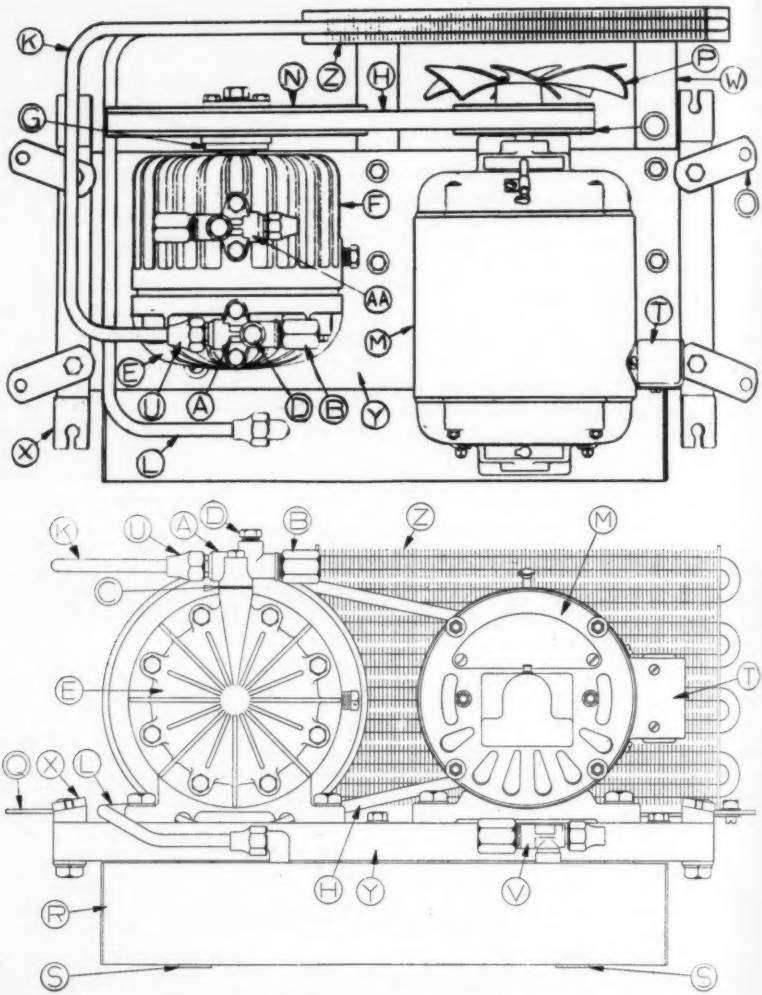



FIG. 2. DETAILS OF THE FORCED FEED OIL SYSTEM EMPLOYED BY THE LANDERS FRARY & CLARK, UNIVERSAL DOMESTIC COMPRESSOR.




FIGS. 3 AND 4. THE UNIT ASSEMBLY FROM THE TOP AND FROM THE SIDE.

A—Discharge Valve
AA—Suction Valve
B—Valve Stem Cap
C—Valve Gaskets
D—Gauge Tap Plug
E—Header
F—Oil Case
G—Seal Plate
H—Belt
K—Condenser Inlet
L—Condenser Outlet
M—Motor
N—Compressor Pulley
O—Motor Pulley
P—Fan
Q—Shipping Brackets
R—Receiver
S—Receiver Support Brackets
T—Motor Terminal Box
U—Condenser Flare Nut
V—Liquid Line Valve
W—Condenser Brackets
X—Suspension Bar
Y—Base
Z—Condenser

### Flapper Valve

The flapper valve detail is shown in Fig. 8. The valve consists of five main parts—the valve seat *A* is part of the high pressure end plate and is ground and polished to a mirror finish; the valve spring *B* made

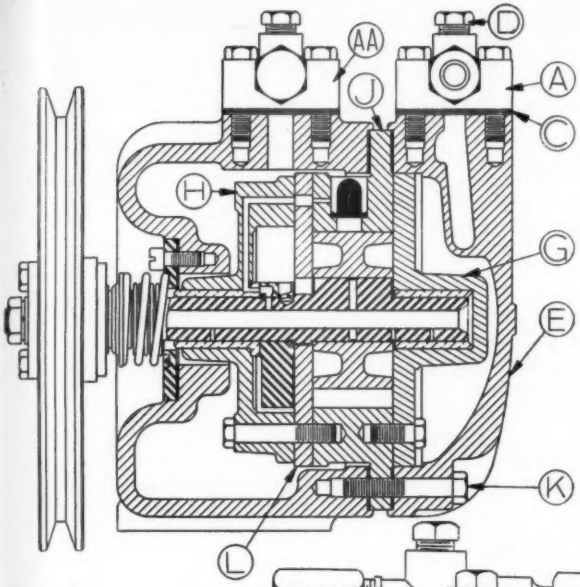



FIG. 5. CUTAWAY DRAWING OF UNIVERSAL DOMESTIC OPEN ROTARY COMPRESSOR.

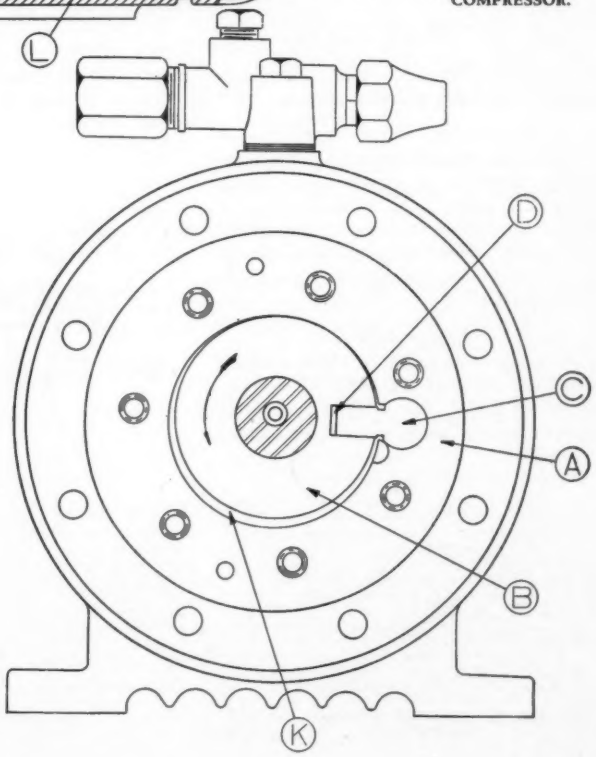



FIG. 6. INTERIOR VIEW OF THE PUMP CHAMBER. A—CYLINDER. B—ROLL. C—BLADE. D—OIL CHAMBER.

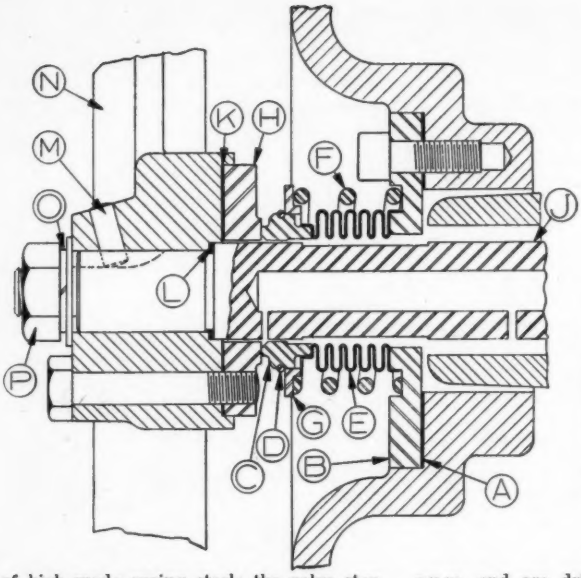



FIG. 7. DETAILS OF SEAL ASSEMBLY.

A—Bellows Plate Gasket
B—A Bellows Plate
E—Bellows
F—Spring
G—Retainer
D—Snap Ring
C—A High Lead Bronze Bearing Ring
H—Seal Plate
K—Seal Plate Gasket
L—Pulley Gasket
N—Pulley

of high-grade spring steel; the valve stop-spring *C*; the valve cover; muffler *E*.

### Liquid Line Valve Assembly

Fig. 9 illustrates the liquid line valve assembly, which is a single-acting shut-off valve. The liquid valve extension tube *A* extends to within ⅛" of the bottom of the receiver. A screen *B* is soldered to the inside of the tube to prevent passage of dirt to the system.

### Specifications

The compressor speed on the 4, 5 and 6 cubic foot cabinets, driven by 1/6-hp. motor is 650 r.p.m. The 7 and 8 cubic foot cabinets have a compressor speed of 850 r.p.m. and are driven by a ¼-hp. motor. All units in these sizes are interchangeable except for motor, horsepower, pulley and belt length.

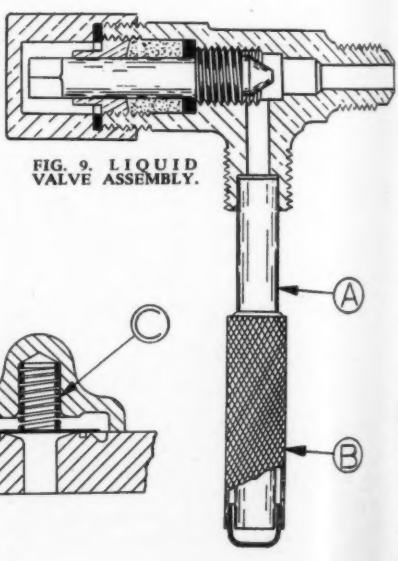



FIG. 9. LIQUID VALVE ASSEMBLY.

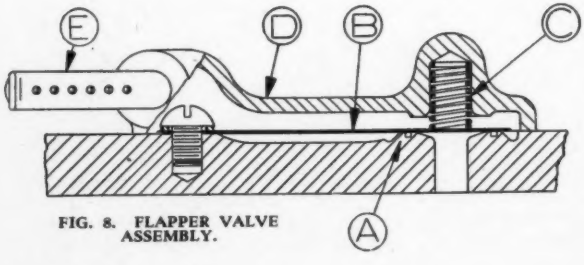



FIG. 8. FLAPPER VALVE ASSEMBLY.

# Service Pointers on the Universal Open Rotary

### 1. Attaching the Head Pressure or Compound Gauge

a. Remove the valve stem cap from the valve.
b. Turn the valve stem all the way to the left.
c. Remove the ¼" pipe plug from the valve gauge tap.
d. Insert a ¼" pipe to ¼" flare union into the gauge tap.
e. Attach gauge to this union.
f. Turn valve stem one-half turn to the right.

Note: To remove the gauge, reverse these operations.

### 2. Purging Air from the Compressor

Sometimes air may have entered the system in spite of all precautions and shows as an increased reading on the head gauge. Therefore:

a. Stop the compressor unit and allow the condenser to cool for ten minutes.
b. Loosen the ⅜" flare nut connecting the condenser to the discharge valve very slightly and allow the air to slowly seep out.
c. As soon as a slight odor of gas is detected, tighten the flare nut.
d. Run the compressor to see if the head pressure has been reduced. (Pressure should be approximately ten pounds lower than the room temperature when the compound gauge reads zero pounds.)

### 3. Testing the Flapper Valve

a. Attach the head and compound gauges.
b. Close the suction line valve, run the compressor a few minutes and draw a vacuum of at least 25" on the oil case.
c. Stop the compressor. Note whether compound gauge shows a loss in vacuum of more than 5" per minute.

### 4. Evacuating Lines

a. Liquid Line.
   I. Close the liquid line valve at the receiver.
   II. Run the compressor until the liquid line near the receiver becomes cold, then warms up. (Determine this by holding the hand on this line.)
   III. Close the liquid line valve at the cooling coil.
   IV. Loosen the liquid line flare nut at the receiver and if no liquid refrigerant is present, the line can be worked on.
b. Suction Line.
   I. Close the suction line valve at the cooling coil.
   II. Let the compressor run until the compound gauge registers 10" vacuum.
   III. Close the suction line valve on the compressor.

   The line may now be disconnected if desired.

### 5. Purging Lines

After either the liquid or suction line have been worked on, air must be forced out of them with $SO_2$ vapor. To purge

a. Liquid Line.
   I. Open the liquid line valve at the receiver.
   II. Loosen the flare nut of the liquid line valve at the cooling coil until odor of gas is detected. Then tighten nut.
   III. Open the liquid line valve at the cooling coil.
b. Suction Line.
   I. Open the suction line valve at the cooling coil.
   II. Loosen the flare nut at the suction valve at the compressor until odor of gas is detected. Then tighten the nut.
   III. Open the suction line valve at the compressor.

### 6. Adding $SO_2$

The best way to add gas is through the suction or low side of the compressor.

a. Open the suction line valve all the way to the left and remove the gauge tap plug.
b. Insert a ¼" pipe by ¼" flare tee into the gauge tap.
c. Attach the gauge tube to one leg of the tee and the charging line of the gas drum to the other.
d. Purge the charging line by opening the valve on the gas drum and loosening the flare nut at the tee fitting until $SO_2$ odor is detected. Then tighten the nut. Test for leaks.
e. Close the suction line valve all the way to the right.
f. Start the compressor and open the valve on the gas drum so as to maintain a steady suction pressure of zero lbs. Always keep the drum in an upright position. It is advisable to place the gas drum on a scale while charging to determine the amount of gas being added to the unit.
g. When charging is completed, close the valve on the drum and open the suction line valve on the compressor all the way to the left.

h. Remove charging line, gauge, tee fitting and replace gauge tap plug. Test for leaks around the plug.

### 7. Taking Out Gas

a. Open the discharge valve all the way to the left.
b. Remove the valve plug and insert tee into gauge tap.
c. Attach gauge and an empty gas drum, which is free from moisture, to the tee.
d. Close the discharge valve, open the valve on the drum and run the compressor until the required amount of gas has been removed. It is advisable to place the gas drum in a pail of cold water to reduce head pressures and aid condensation of the gas in the drum.
e. Stop the compressor, close the valve on the drum, open the discharge valve on the compressor, remove the fittings and replace the gauge tap plug.

NOTE: If an empty gas drum is not available, it will be necessary to take out the gas by neutralizing. Therefore, proceed as in (a) and (b). Cap one leg of the tee and attach a piece of tubing to the other, sufficient in length to extend to the bottom of a water pail into which a lye solution (1 lb. of lye per gallon of water) has been placed. Turn the valve stem very slightly to the right and allow the $SO_2$ to slowly bubble through the lye water. One pound of lye will neutralize three-quarters of a pound of $SO_2$. After the gas has been discharged, remove the discharging tube from the lye water before turning the valve stem because the lye solution will back up in the tube. If this precaution is not taken, moisture will get into the unit. Remove the discharging tube, fitting and replace the gauge tap plug.

### 8. Adding Oil to Compressor

In performing this operation, it is important to keep air from entering the unit, so that there must always be an excess amount of oil in the container from which oil is drawn, to eliminate the possibility of the end of the oil charging tube from not being submerged at all times.

a. Close the suction line valve at the cooling coil.
b. Remove the gauge plug from the compressor suction valve, insert the tee fitting and attach a short length of tubing (oil charging tube) to one leg of the tee, cap the other tee opening.
c. Place the end of the tubing into the vessel containing more oil than is necessary.
d. Start the compressor and turn the valve stem slightly to the right until the necessary oil is drawn into the compressor.
e. Turn the valve to the left, stop the compressor and remove the oil line fitting. Replace the gauge tap plug.
f. Open the suction line valve at the cooling coil and place the refrigerator in operation.

### 9. Changing the Compressor Body

a. Close the suction line valve on the compressor body.
b. Run the compressor unit a few seconds to reduce oil case pressure to zero pounds.
c. Close the discharge valve.
d. Remove the valves with tubing attached from the compressor body.
e. Take out the compressor mounting bolts and remove the compressor body from the frame.

### 10. Changing Condenser-Receiver Assembly

a. Attach the compound gauge.
b. Proceed as in Operations 7 a.b.c. and d. Note: In order to determine whether sufficient gas has been removed and the condenser-receiver is empty, stop the compressor and by opening the discharge valve a half turn, allow the pressure from the drum to enter the condenser. Watch the compound gauge and if the pressure on the low side rises rapidly, there is no gas left in the receiver.
c. Close the liquid and suction line valves at the cooling coil and disconnect the liquid line from the receiver.
d. Remove the motor.
e. Disconnect the condenser inlet from the compressor body at the discharge valve. Remove the condenser mounting screws, take out the condenser-receiver assembly and replace.
f. Attach the liquid line to the new condenser-receiver assembly and fasten condenser inlet tube to the discharge valve.
g. Slightly open the liquid line valve at the cooling coil and purge the condenser at discharge valve. Test for leaks.
h. Remove gas drum from high pressure side, attach it to the low pressure side and recharge the unit.

### 11. Changing Compressor Unit

a. Close the liquid line valve at the receiver and evacuate the liquid line.
b. Close the liquid line valve at the cooling coil.
c. Close the suction line valve at the cooling coil and evacuate this line.
d. Close the suction line valve at the compressor.
e. Disconnect the liquid line at the receiver and the suction line at the compressor. Remove the complete unit.

### 12. Flushing the Float Valve

Sometimes a float valve may be found to be holding open due to a piece of dirt or metal chip lodged between the float needle and the seat. Rather than remove the float valve, which is a long process, the foreign matter can occasionally be flushed out.

a. Close liquid line valve at the cooling coil.
b. Run the compressor about fifteen minutes.
c. Open liquid line valve as quickly as possible so that the rush of liquid $SO_2$ into the cooling coil will dislodge any particles on the needle seat.
d. Observe the unit to see whether it is operating properly. If not, change the float valve.

### 13. Changing the Float Valve

a. Attach the high pressure and compound gauges to compressor.
b. Close the liquid line valve at the receiver.
c. Run the compressor until the compound gauge shows at least a 20" vacuum, indicating that the cooling coil is empty.
d. Stop the compressor for a few minutes and observe the compound gauge. If this remains stationary or changes very slowly, it indicates that the cooling coil is empty. Should the gauge pressure increase materially, either the coil is not empty or the flapper valve leaks. Check the flapper valve as in Operation 3. If the flapper valve holds, run the compressor again until the gauge shows that the cooling coil is fully evacuated.
e. Quickly open and close the liquid line valve at the receiver until a pressure of 1 lb. is recorded on the compound gauge.
f. Close the suction line valve at the compressor.
g. Remove all moisture from the cooling coil header and fittings with a dry rag. Remove header bolts. Remove suction and liquid lines from the valves.
h. Take out the float valve and immediately replace with a new valve which has been prepared beforehand. Be sure *always* to use a new header gasket.
i. Replace header bolts, lines and tubing on the new float valve. Close valves on new float valve.
j. Purge lines. Test for leaks. Open all valves.

### 14. Adjusting the Thermostat

Thermostats are adjusted to give correct cabinet temperatures at the factory. Occasionally a user wants a colder or warmer setting beyond the range of the dial.

a. To lower the temperature range:
   I. Turn the dial pointer to the extreme right. (Position 9.)
   II. Take out the dial plate screw.
   III. Remove the dial pointer and plate from the range adjusting screw.
   IV. Return the pointer to the vertical position on the plate.
   V. Replace on the range adjusting screw.
   VI. Replace dial plate screw.
   The temperature range of the thermostat has thus been lowered approximately 5° F. because one number on the dial is equivalent to .9 of one degree change in temperature.
b. To raise the temperature range:
   I. Turn the dial pointer to the extreme left.
   II. Proceed as in operations II to VI inclusive above.
   The temperature in this case has been raised approximately 2° F.
c. Differential adjustments are obtained by turning differential screw. To raise cut in point, turn screw counter clockwise; to lower cut in temperature, the screw is turned clockwise. *A change of differential setting does not change cut out temperature.* One revolution of the screw changes the range 4½ degrees.

### 15. Changing the Thermostat

Remove the two screws in cooling coil front and loosen wing nut which holds the bulb against side of the coil. Thermostat assembly may then be removed. In replacing, extreme care should be taken not to bend the capillary tube sharply especially at the joint between the tube and bulb.

### 16. Changing the Evaporator Assembly

a. Evacuate the liquid and suction lines as explained in operation 4.
b. Change the evaporator assembly.
c. Connect the lines and purge as explained in operation 5.

## Analysing Service Conditions

### Compressor Runs Continuously

A. Cabinet not cold enough.
It is apparent that there is a lack of refrigeration and since refrigeration depends upon the amount of liquid $SO_2$ evaporated in the cooling coil, there may be a shortage of gas in the system or that the float valve is not seating properly. Both conditions will cause a hissing sound at the float valve. To determine which is causing the trouble, check the suction line and if there is a shortage, the suction line will be comparatively warm. Add $SO_2$ to eliminate the difficulty. If the suction line is found to be cold, sweating or frosted, it indicates that there is sufficient $SO_2$ in the system but that the float valve is held open, permitting the liquid to rise too high in the evaporator and to overflow down the suction line, allowing it to evaporate in

*(Continued on page 34)*

# The Oil Separator

**Oil Is Essential in Its Place, But Its Place Is Not in the Condenser, Liquid Receiver, Evaporator, Refrigerant Lines, Etc., This Article Describes an Oil Separator With Automatic Oil Return.**

*By* O. F. NELSON *

OF great interest to service men, engineers, designers and the refrigeration user at large, at the present time is the oil separator with automatic oil return. An oil separator is a device that removes the oil from the high pressure discharge gas (as it leaves the compressor, and before reaching the condenser), and returns it to the compressor crank case, where it belongs. All compressors pump a certain amount of oil, some more than others.

It is quite obvious that oil in the condenser, liquid receiver, evaporator and refrigerant carrying lines has no beneficial effect on the system, and it has been definitely proven that an oil film on the inside of an evaporator wall slows down heat transfer.

Acute cases such as oil trapping in low side floats, where methyl chloride is the refrigerant, the evaporator in many instances becomes completely oil logged, doing no refrigeration whatsoever, and for some years the service man, having no other means for correcting this condition other than emptying the oil from the logged evaporator, which in time would only oil log again, has borne the brunt of this trouble.

It can be readily seen that it would not take many oil logged evaporators to drain the crank case of its oil supply, resulting in worn out seals, burnt out compressor bearings and motors.

The buying public is becoming more intelligent and obviously they will not continue to pay for these service calls after they learn how this particular trouble can be overcome.

Lubrication is essential to the moving parts of all compressors, but elsewhere in the refrigerating system it is a frequent cause of trouble.

Scored, or burned out bearings—oil logged evaporators—oil loaded liquid receivers—gummed-up expansion coils and plugged expansion valves are some of these troubles.

Lubricating oils and refrigerants mix more or less freely but in varying proportions depending on pressure, temperature and the chemical composition of the oil and refrigerant. The refrigerants evaporate, or boil, at low temperatures whereas the lubricants boil at temperatures several hundred degrees higher and naturally, the oils at evaporator temperatures tend to congeal and build up on the inside of the cold evaporator walls, making it difficult to get the oil back to the compressor.

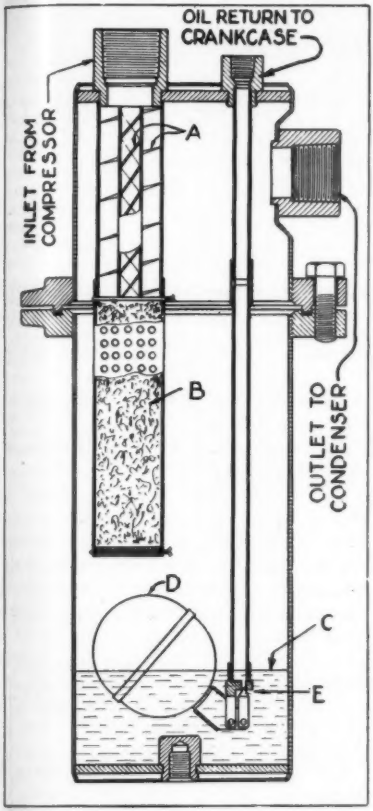
Methyl chloride and Freon present unusual difficulties in the matter of lubrication and much study has been given to these problems. However, no scheme or device, for returning oil from the evaporators has been entirely satisfactory. There is no good reason, however, for permitting oil to circulate through the low pressure side.

Oils creep past the pistons due to various conditions — capillary attraction — pressure differences between crank case and cylinders during the suction and compression strokes —the emulsifying of oil and refrigerant in the crank case due to the churning action of the crank and connecting rods, etc.

These oils, unless separated out of the discharge gas, liquefy in the condenser and liquid receiver, and from this point pass to the evaporators where, due to low temperatures, the oils become viscuous and start to congeal.

If you will refer to the sectional view of an oil separator with automatic oil return of acceptable design you will notice that this design embodies a steel shell sufficiently

* Chief Engineer, Riley Engineering Corporation.




SECTIONAL VIEW OF OIL SEPARATOR.

large to retard gas velocity and partially remove the sensible heat of compression, but retarding the gas violently alone is not sufficient in itself.

The oil ladened discharge gas from the compressor passes through the counter flow, scrubbing labyrinth of spirally wound tubing (A) into and through a woven shredded metal (B) which absolutely assures that every atom of gas and oil must impinge on an oily surface before it can leave the oil separator. Oil globules collect and drop by gravity to the bottom of the oil separator, and when the oil level (C) is sufficiently high the float ball (D) lifts and the collected oil passes through the needle valve (E) back to the crank case.

Methyl, Freon or sulphur oil pumping compressors are all equally well served by a skillfully designed oil separator with automatic oil return.

S S S

## ROTARY ADDS 5 UNITS TO REPLACEMENT LINE

THE Rotary Seal Co. of Chicago has recently added five new replacement units to its extensive line of shaft seals, which now covers some 31 different types for the principal machines now in the field.

The five recently added are for the Welsbach, Electro-Kold, Universal Cooler, Crosley and Stewart Warner.

Recognizing the importance of immediate delivery on their product, the company has provided a nation-wide distribution through jobbing outlets. These points of distribution are being added to constantly to provide a quicker service to all points.

S S S

## NEW ANSUL CATALOG

WHILE the foreword in presenting the new Ansul catalog terms it a "booklet," we believe that this does not adequately describe the amount of information contained in this book, which is 8½x11 in. in size.

The book contains some sixteen subjects which are thoroughly treated. These subjects include information on cylinder equipment for sulphur dioxide and methyl chloride; directions for transferring refrigerants to small service drums; sulphur dioxide total heat-pressure diagram with instructions for use; sulphur dioxide data covering saturated and superheated vapor (temperature table); methyl chloride total heat-pressure diagram with instructions for use; methyl chloride data covering saturated liquid and vapor-temperature table; methyl chloride superheated vapor-temperature table, and others equally informative.

The book is bound in loose-leaf form and additional sheets will be released from time to time as soon as research and engineering work now in progress is completed.

# *Servicing the* Nizer-Kelvinator Pressure Control

**Pointers on the Servicing and Adjustment of the Pressure Type Controller, Operated by Low and High Pressure Bellows.**

By PAUL JACOBSEN*

THE Nizer-Kelvinator pressure controller consists of a metal case 6" wide, 4½" high and 3" deep.

The switch itself is located in the bottom of the case and is through an arrangement of levers connected with the two sylphons—one for the high side and one for the low side of the system. These sylphons are located on top on the outside of the case which contains bellows, springs and the necessary adjustment nuts.

The switch operates on a toggle arrangement and is mounted on a Bakelite plate.

The old style switch has copper contacts and the new style switch a Mercoid bulb. This improvement was made especially for machines which have no magnetic starter switch. Where no such switch is installed, the automatic switch carries the full load of current and considerable trouble was due to burned contact points.

### Service Call on the Controller

When receiving a service call on controller trouble, the first thing to do is to clean all the moving parts of the controller and to give them a little oil. Next, see that all the parts move freely and that there is no binding at any point.

Check the contact points on the switch and change them if they are burned. See that the switch bar latches properly and makes contact on both points at the same time.

Check the fulcrum adjustment. If this is correct the hinge pin in the fulcrum rod should be level with the hinge pin in the two lever bars when the switch is in top position.

It is important that this adjustment is correct before any attempt is made to adjust the controller.

### Margin of Travel of Low Pressure Bellows Rod

The total travel of the low pressure bellows rod is 5/32 in.

The movement required to operate the switch is 3/32 in.

The low pressure sylphon should be shimmed up so that there is 1/32 in. travel of the bellows rod in both cut-in and cut-out end after the switch has cut in or out. This is obtained by adding or removing the shims under the sylphon—these shims being 10/1000 in. in thickness.

### Adjusting the Controller

After having checked everything and being sure that it is in working order, it is possible to adjust the controller.

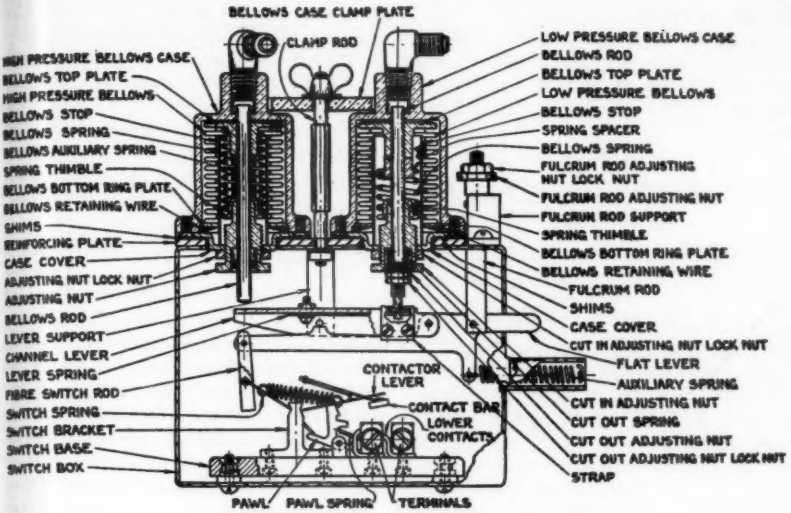
The first thing to do is to run the small adjustment nuts down so that there is no tension on the spring, then cut the switch out manually and shut off the main switch so that the machine will not run.

Screw the large adjustment nut down until the switch cuts in and note the pressure reading on the gauge. If the reading is not the one you want, then adjust the control by turning the nuts up for higher temperature and pressure and down for lower temperature and pressure until the desired setting is obtained.

Be sure that no more than 2½ to 3 threads are showing on the adjustment nut. If more threads are showing it will be necessary to put more tension on the auxiliary spring located on the right hand side of the case and then repeat the procedure as mentioned above.

To adjust the cut-out of the switch, start

* Dependable Refrigeration Service Co., Chicago. President, Chicago Chapter, R.S.E.S.




NIZER PRESSURE CONTROL SWITCH.

the machine up and allow it to run until the desired back pressure reading is showing on the gauge, then turn the small nut up or down in order to have the machine cut-out later or earlier.

These small nuts are to be turned up for lower temperatures and down for higher temperatures.

Always adjust the large nuts first—that is the cut-in adjustment because any change in these nuts will affect the adjustment of the cut-out, whereas changes in the cut-out adjustment will not affect the cut-in setting.

Each flat or 1/6th of a turn changes the temperature of the coil approximately 3°F.

The threads on the large nuts are coarser than on the small nuts in the ratio of 2 to 1 and if the large nuts are turned up one flat, it is necessary to turn the small nuts up 2 flats in order to maintain the same cut-out temperature.

### The Auxiliary Spring

On the right hand side of the case is a small barrel with a number of small holes in it. Inside this barrel is a spring connected to the levers of the controller in one end and to a cotter pin in the other end. This cotter pin may be inserted in any one of the holes in the barrel on the side of the case.

Tightening this spring lowers both starting and stopping point of the machine and vice versa. It is, however, always better to make any adjustments by means of the adjustment nuts rather than to depend on the auxiliary spring.

*Example:* Raise starting temperature 6°F. Maintain same stopping temperature.

*Procedure:* Turn the large nuts up 2 flats or one-third of a turn to raise starting temperature 6°F.

Turn the small nuts up 4 flats or two-thirds of a turn to maintain same stopping temperature.

*Example:* Lower starting temperature 3°F. Lower stopping temperature 6°F.

*Procedure:* Turn large nut down one flat to lower starting point 3°. Turn small nuts down 2 flats to maintain same stopping point as before. Now raise the small nuts 2 flats to lower the stopping temperature 6°F.

### The High Pressure Side

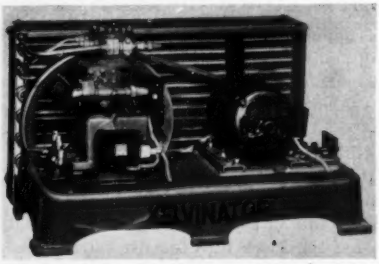
Add or remove shims so that there is a clearance of 10/1000 in. between the high pressure sylphon rod and the control lever and adjust the nuts so that the switch cuts out from high pressure on a water-cooled

machine at 90 lbs.

On an air-cooled machine there should be a clearance of 20/1000 in. between the high pressure sylphon rod and the control lever and it should be adjusted to cut out at 125 lbs.

## NEW KELVINATOR CONDENSING UNITS

DESIGNED especially to meet the growing demand for commercial refrigeration in many lines of business, a new commercial condensing unit line, consisting of 128 condensing units, has been announced by Kelvinator Corporation. The new line meets all temperature requirements, including low temperatures for ice cream hardening, standard temperatures for grocery, market, restaurant and florist installations and relatively high temperatures for beer cooling, water cooling, milk cooling or air conditioning.



NEW 1½ HP KELVINATOR AIR COOLED CONDENSING UNIT

Ten standard blocks, a block for every motor size, provide for the new units, which range in size from ¼-horsepower to 20-horsepower. In "pounds" of refrigerating effect, this range is from 100 pounds to approximately 40,000 pounds of ice per day. The new Kelvinator line also includes gasoline driven units for installations where there are no electric power lines.

"Kelvinator's new condensing unit line is brought out at a time when there is a large increase in commercial refrigeration installations," said J. A. Harlan, commercial manager, in commenting about the new units. "With 21 years of experience in the temperature control field, Kelvinator now makes its exact selection line of commercial equipment even more complete, to provide specific equipment for every commercial refrigeration need.

"The new units are the finest that Kelvinator has ever built, incorporating many important and exclusive features which lower operating costs, increase dependability and provide greater values. A few of the most important features of construction are:

"The cylinder blocks, pistons, valve plates, cylinder heads and compressor housings are made of a fine grain, cast iron solution, specially formulated for refrigeration service. The cylinder wall, piston pin holes and bearings are diamond bored to give greater efficiency and quiet operation. By placing both the suction and discharge valves in the cylinder head, the gas refrigerant does not enter the crankcase and oil pumping is eliminated. The valves are of the flat, reed-type, made of flexible, high-grade, Swedish steel.

"Larger condensers with increased capacities, heavier bases, improved appearance, quieter operation and more flexibility are provided in the units which have drop forged connecting rods, bronze bearings, balanced crankshaft, balanced compressor seal, balanced compressor pulley, refrigerant or water-cooled compressor cylinder heads, condenser fans, and heavy duty, refrigerating type motors.

"Recognizing the desirability of being able to make an exact selection in refrigerants, Kelvinator has condensing units in regular production using sulphur dioxide, methyl chloride and Freon. Each refrigerant has its own special field of application."

## BAKERY REFRIGERATION

A SPECIAL application of water cooling is provided in bakeries where dough from the mixer should be approximately 80° F. for uniform texture. This result can be obtained by using 86° water in the mix or water jacketing the mixer with 40° water or both. In figuring this heat load, you must consider the heat generated from mixing flour and water, heat of mixer motor and the heat of flour.

# *Preventing*
# Oil Trapped Suction Lines

**This Article Suggests Practical Methods for Oil Return "Hook ups" Friction and Suction and Liquid Valve Tables.**

*By* HERBERT HERKIMER *

RESTRICTIONS in the suction line should be avoided in order to be able to adjust the low pressure control for the highest cut-out setting in order to obtain maximum efficiency. One of the most common causes of restricted suction lines causing improper operation with a very low cut-out setting is due to oil trapped suction lines. The


FIG. 1. OIL TRAPPED IN SUCTION LINE.

oil collects in the trapped part of the suction line, as shown in Fig. 1, and reduces the size of the gas passage, which in turn makes necessary a lower cut-out setting of the switch. The sketches shown on Plate A offer several suggestions to meet conditions with in practice as it is seldom that drainage is possible from the evapor rectly into the crankcase of the con The following describes the various of installing oil trapped suction line lustrated in Plate A.

### The Double Tube System

The double tube system, illustrated 1 and 2, Plate A, insures positive retu oil to the crankcase by gravity flow. This method is required where the suction line must be run on the floor level or placed in conduit buried in the floor. When suction piping or tubing is run along the floor, it is almost impossible to slope properly from the evaporator to the compressor, and if operating on a low back pressure with a long suction line, considerable oil may collect in the suction line if this method of installation is not used. Allowance must be made in charging lubricating oil to fill up the long runs of suction piping, otherwise the system will be operated wtih insufficient lubrication.

### Friction Table

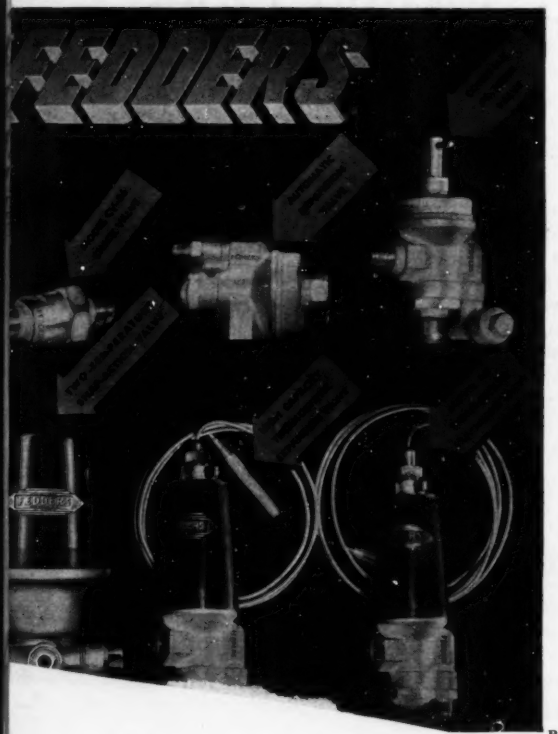
PRESSURE DROP IN FREON SUCTION LINES

In Pounds per sq. in. per 100 ft. length of tubing, including an average number of fittings.

| Suction O. D. Tube | Back Pres. Lbs. sq. in. | REFRIGERATING LOAD THOUSANDS OF B. T. U's PER HOUR | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 5 | 10 | 20 | 50 | 100 |
| *½ | 3 | .80 | | | | | |
| | 17 | | | | | | |

* Herkimer Institute.

# How Fedders COMPLETE

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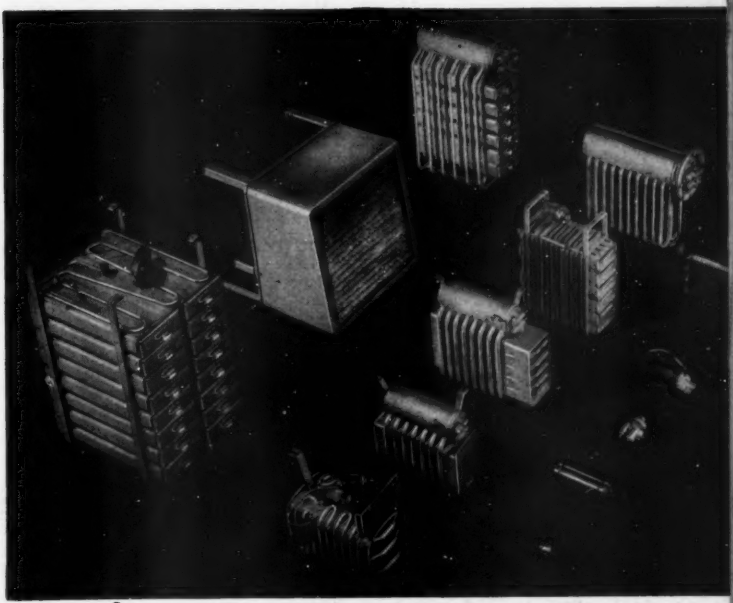

*Just a few of the Fedders models including ice cube makers, Forcedraft unit coolers, household and commercial evaporators, and condensers.*

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Home ire Co
HOUST
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LOS A LIP.
National n Products Co.
Franklin
LOUIS
Geo. De
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Refrige rial Supply Co.

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PITTSBURGH, PA.
William M. Orr Co.
PORTLAND, ORE.
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SAN FRANCISCO, CALIF.
California Refrigerator Co.
Refrig. & Power Specialties Co.
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Refrigerative Supply, Inc.
Refrig. & Power Specialties Co.
SPOKANE, WASH.
E. S. Matthews, Inc.
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Refrigeration Parts Supply Co.
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The Spangler Company
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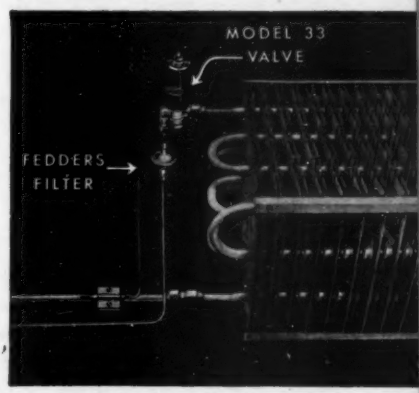


*Four complete lines of Commercial evaporato including Flat Fin, Fluted Fin, Fed-R-Fin an Finless types.*

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## E MANUFACTURING CO.

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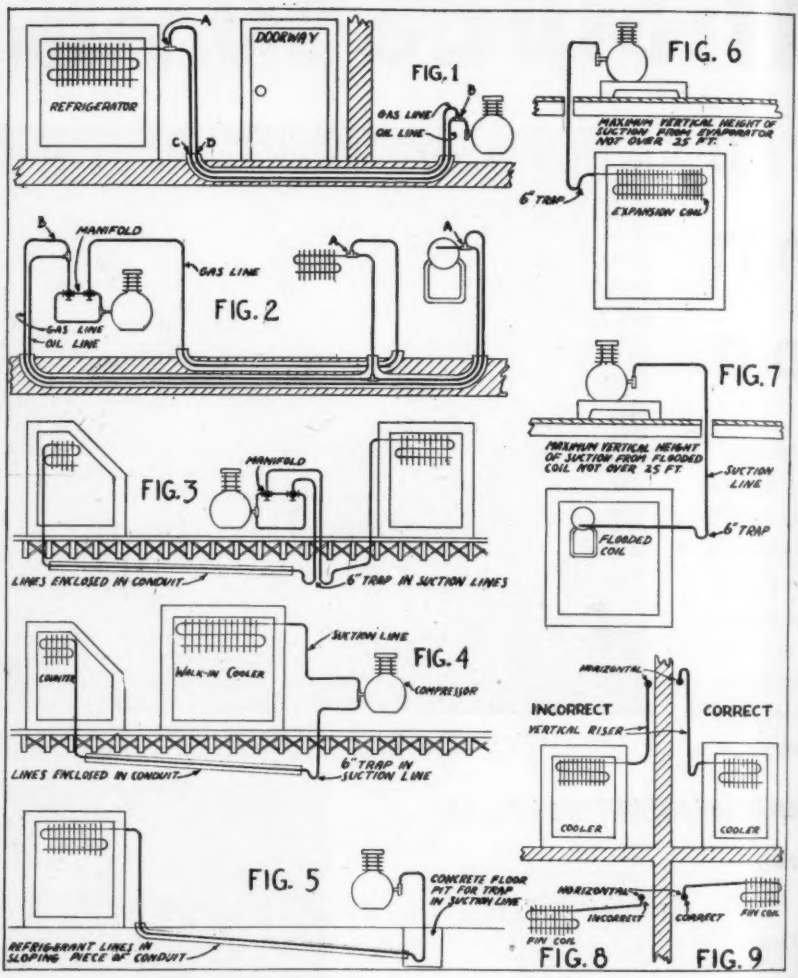



PLATE A. VARIOUS METHODS OF INSTALLING SUCTION LINES.

other evaporators down the riser into the suction line to the coil in refrigerator and to the finned coil beneath, and in addition, the oil will not return from the coil in refrigerator. Fig. 9, Plate A, shows the correct system of running the suction tubing to the riser and the correct method of connecting the suction line to riser.

### The "U" Return

When the suction connections to the crankcase, or when the manifold valves are located above the evaporator, or when it is possible to install the suction lines beneath the floor, a six-inch "U" shaped bend in the suction line, as illustrated in Fig. 3, 4, 5, 6 and 7,

*(Continued on page 36)*

# THE Question BOX

**Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box" which will be answered by competent authorities.**

**THE following questions submitted to this department are answered by Mr. George H. Clark, chairman National Educational and Examining Board, Refrigeration Service Engineers Society.**

**Have any readers other opinions regarding the problems involved. Send them to the Editor.**

## EXPANSION VALVE SETTING

*Question 84. I am taking the liberty of writing to you on a question that has been bothering me for quite some time. On a domestic refrigerator using sulphur dioxide, I have been taught to set the pressure reducing device, direct expansion valve for example, for zero liquid in the evaporator which is 9" vacuum. Why is it that some manufacturers state that their machine should be set for 3" vacuum, and still another will state that their machine should be set at a 6" vacuum? What is the advantage of these different settings, if any, over the 9" vacuum setting?*

ANSWER: This matter of expansion valve setting is largely a matter of judgment which comes from experience.

Evaporators which have very little holdover—that is, those of the newer dry type—generally will require a refrigerant temperature of from 0° to 6°; on the other hand, older style brine tanks could operate satisfactorily at atmospheric pressure, thus giving a refrigerant temperature of 18°. In brine tanks which make use of cold control, the refrigerating temperature corresponding to 6" vacuum may be required in order to insure that the control will turn off when set on the coldest point.

In general, the suction pressure, and thereby the evaporating temperature, depends on the type of evaporator used, the temperature desired in the refrigerator, the type of control, and in some cases, the size of the refrigerating machine used. The manufacturers usually make tests in their laboratories to determine what suction pressures are required to give best results in their particular combination of machine, evaporator and refrigerator, and make their recommendations accordingly.

## ON INSTALLING CHECK, TWO-TEMPERATURE AND CONSTANT PRESSURE VALVES

*Question 85. I am somewhat of a newcomer in the refrigeration field and I would like further information on the following:* (1) *In the February issue on Page 8, in the article entitled, "The Uses of Constant Pressure and Check Valves." How is it determined which unit has the low temperature at the evaporator and which unit has the high temperature at the evaporator, when more than one is connected to the same compressor?* (2) *In the sweet water bath cooler, you say that the setting would be taken care of by the snap action valve. Would appreciate very much if you would explain this valve to me.* (3) *In this article are shown four units connected to the same compressor. At the return line, or suction line, you show both valves—the two-temperature and the constant pressure valve. What I would like to know is, is it necessary to use both of these valves when the hookup as shown is used? If so, please let me know how they are installed.*

**Answered by Joe Askin, Engineer, Fedders Mfg. Co.**

ANSWERS: (1) To determine which unit is the high temperature unit and which is the low temperature unit, the following table prepared by the Fedders Manufacturing Co. on their line will give the pressure control setting for various types of low-sides. The lower the setting of the pressure control the lower will be the temperature of the evaporator. This table will show which evaporators operate at low temperature. (2) At the present time we do not have the diagrammatic

APPROXIMATE PRESSURE CONTROL SETTINGS
Pressure in Pounds Gage; Vacuum in Inches Mercury

| TYPE OF LOW SIDE | APPLICATION | Sulphur Dioxide (SO2) | | Methyl Chloride (CH3cl) | | Freon (CCl2F2) | |
|---|---|---|---|---|---|---|---|
| | | Cut-out | Cut-in | Cut-out | Cut-in | Cut-out | Cut-in |
| S&L series, Flooded Type Cooling Units | Commercial and Domestic Refrigerators | 8" vac. | 6 lbs. | 5 lbs. | 17 lbs. | 10 lbs. | 25 lbs. |
| C-135, C-136, C-137 Flooded Type Cooling Units | Ice Cube Maker | 14" vac. | 0 lbs. | 0 lbs. | 11 lbs. | 4 lbs. | 17 lbs. |
| FC-6, FC-8, FC-16 Dry Evaporators with T.E.V. | Ice Cube Maker | 14" vac. | 0 lbs. | 0 lbs. | 11 lbs. | 4 lbs. | 17 lbs. |
| C-100 to C-16 W series, Flooded Type Cooling Units[1] | Ice Cream Cabinet—Brine Tank | 14" vac. | 6" vac. | 0 lbs. | 6 lbs. | 4 lbs. | 12 lbs. |
| C-100 to C-16 W series, Flooded Type Cooling Units[2] | Beer Cooler, Water Cooler —Sweet Water Bath | 0 lbs. | 6 lbs. | 11 lbs. | 19 lbs. | 17 lbs. | 27 lbs. |
| 600, 700, and 800 series[3] | Show Cases and Reach-In Coolers | 8" vac. | 5 lbs. | 5 lbs. | 17 lbs. | 10 lbs. | 25 lbs. |
| 600, 700, and 800 series[4] | Show Cases and Reach-In Coolers | 0 lbs. | 10 lbs. | 12 lbs. | 25 lbs. | 18 lbs. | 34 lbs. |
| Dry Evaporator Coil connected to Model 33 T.E.V.[5] | Ice Cream Cabinet—Brine Tank | 14" vac. | 6" vac. | 0 lbs. | 6 lbs. | 4 lbs. | 12 lbs. |
| Dry Evaporator Coil connected to Model 33 T.E.V. with Sweet Water Bath[6] | Beer Cooler, Soda Fountain, Water Cooler, Milk Cooler—Sweet Water Bath | 2" vac. | 6 lbs. | 10 lbs. | 19 lbs. | 16 lbs. | 27 lbs. |
| Non-Frost Commercial Evaporators[7] | Walk-In Coolers, Reach-In Coolers, Show Cases | 6" vac. | 10 lbs. | 6 lbs. | 24 lbs. | 12 lbs. | 33 lbs. |
| Non-Frost Commercial Evaporators[8] | Ice Cream Trucks, Ice Cream Hardening Rooms | 16" vac. | 2" vac. | 4" vac. | 9 lbs. | 2 lbs. | 15 lbs. |
| Coils Soldered to a Flat Plate and connected to a T.E.V. | Vegetable Display, Fish Shelf | 8" vac. | 10 lbs. | 5 lbs. | 24 lbs. | 11 lbs. | 33 lbs. |
| Coils in a tank connected to a Model 33 T.E.V. | Eutectic Brine Tank for Ice Cream Trucks | 18" vac. | 14" vac. | 6" vac. | 0 lbs. | 1 lb. | 4 lbs. |
| Forcedraft Unit Coolers | Walk-In Coolers, Reach-In Coolers | 0 lbs. | 10 lbs. | 12 lbs. | 27 lbs. | 18 lbs. | 36 lbs. |
| Air Conditioning Coils | Stores, Offices and Buildings | 9 lbs. | 21 lbs. | 23 lbs. | 40 lbs. | 32 lbs. | 52 lbs. |
| B and R series Beer Coils—Sandwich Type | Beer Coolers | 6 lbs. | 15 lbs. | 20 lbs. | 28 lbs. | 28 lbs. | 37 lbs. |

[1]Alcohol or Calcium Chloride Brine. [2]Ice Accumulation around coil. [3]Frosting Cycle. [4]Defrosting Cycle.
[5]Alcohol or Calcium Chloride Brine. [6]Ice Accumulation around coil. [7]Defrosting Cycle. [8]Not non-frost in this case.

view of a snap action valve described, but expect to issue this information in a bulletin very shortly. (3) Regarding the sketch showing four units hooked in multiple, we have shown both valves at each suction connection. Either valve may be used. We merely tried to save space by showing on one sketch the above valves and their application. The constant pressure valve, of course, is for single and multiple systems, where constant pressure is required for a more uniform temperature condition in cooling a unit or evaporator. The installation is made between the outlet of the evaporator and suction side of the compressor. The valve is easily adjusted with thumb nut to maintain the desired gauge pressure in the low-side.

The check valve, of course, is used on multiple installation to keep the high pressure gas in the warmer evaporator from backing up into the colder evaporator, and it is installed between the outlet of evaporator and the suction side of compressor.

## SERVEL HERMETIC

*Question 86. Would you kindly advise me if the Servel hermetically sealed unit Number SE5 can be charged in the field? This unit runs but will not freeze. If it can be charged please advise me of the procedure. Any information on this job will be greatly appreciated.*

Answer: The Servel hermetically sealed machine can be charged in the field by installing a three-way valve in the suction line. The refrigerant may thus be charged into the suction side of the system from a

service drum using the side opening on the three-way line valve. The same opening may be used to determine the evaporation pressure in the system.

It is well to be certain that the cause of the machine not freezing is lack of refrigerant rather than some trouble in the compressor or refrigerant passages in the system before refrigerant is added. This may be done by applying a gage to the three-way valve before refrigerant is charged into the system. A very low suction pressure with no refrigeration will indicate a stoppage some place in the liquid line or evaporator. If the suction pressure is high and is not reduced as the machine operates, it probably indicates that the compressor is not functioning properly. If the suction pressure pulls down and a noise of vapor passing into the evaporator may be heard, you may be reasonably sure that it is lack of refrigerant which is causing the trouble.

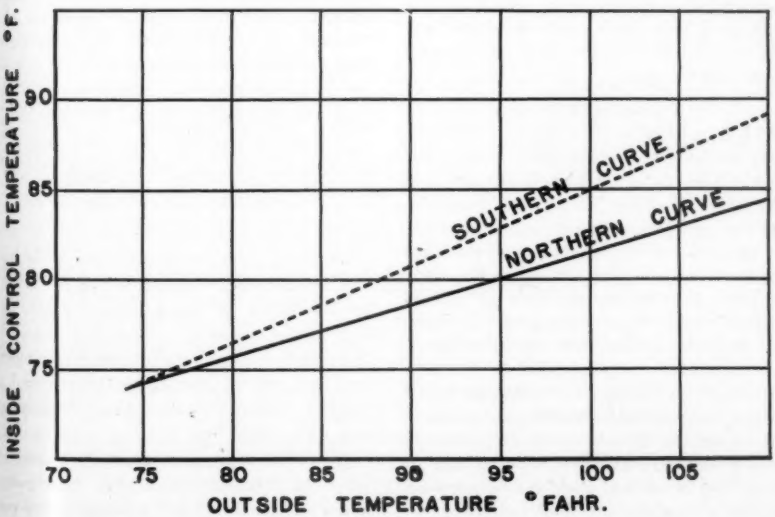
Of course, installing the three-way valve in the suction line will necessitate losing any vapor in the suction side of the system unless the line is pinched off at both sides of the point on the line which is to be cut open to install the valve.

## COMFORT CURVE FOR SOUTHERN AND NORTHERN STATES

THE American Society of Heating & Ventilating Engineers "Comfort Curve" marks very closely the relative amount of cooling needed in the Northern part of this country to assure comfort indoors during the hot weather. It is generally recognized, however, that the temperature range represented by this curve is too low for maximum comfort throughout the Southern states, where both temperature and humidity are appreciably higher during the summer season.

The accompanying chart indicates the difference in relative comfort temperatures for the two regions. The lower curve is the A.S.H.V.E. "Comfort Curve" which coincides with the cooling demands in the North. The upper curve represents the desired comfort conditions in the South.

Obviously, this situation presents a problem in temperature control practice. This problem is definitely answered, however, by the "Detroit" Differential Thermostat No. 691, manufactured by the Detroit Lubricator Company. This instrument is supplied in either a Northern range corresponding to




COMFORT CURVE FOR NORTHERN AND SOUTHERN TEMPERATURE

the A.S.H.V.E. curve or a Southern range corresponding to the upper curve in the chart previously mentioned.

By a simple factory adjustment, these temperature ranges may be shifted up or down slightly if desired. This adjustment, when made, changes all points on the curve by an equal amount. It will be necessary only to meet special conditions.

## THE FUTURE OF REFRIGERATION SERVICING

IN the May issue of THE REFRIGERATION SERVICE ENGINEER appeared an article, "Recent Trends Forecast the Future of Refrigeration Servicing," including expressions from men actively engaged in the servicing business in various sections of the country, as to the development of the servicing business and its future possibilities.

A striking similarity in all the conclusions was noticeable as to the advance that this business had made and the prospects for its future progress. Supplementing the letters published in the May issue, we present additional ones.

The purpose in publishing these letters is to point out that the service business recognizes certain conditions with which they are confronted and which must be successfully met in order that the industry may advance on a stable basis.

### From Missouri

"I believe the demand for independent servicing has increased considerably as compared with the demand of two or three years ago. The progress of the independent companies depends upon the efficiency and dependability of their service which, of course, must compare favorably, if not better, in every respect with the manufacturer-maintained service organization. I am sure that every man in business today who considers his future prospects recognizes that it should be our first consideration to render an honest service without misrepresentation, which, of course, applies directly to the diagnosing of trouble, the replacement parts used, etc. It is needless to say that there has been a practice to "gouge" the customer and, of course, this practice is eventually discovered. Servicing organizations and manufacturers should mutually cooperate to build and hold public confidence by maintaining the highest standard of service, by avoiding and eliminating business-wrecking, price-cutting practices, and endeavor to establish some uniform standard of price basis for certain standard installation and servicing work. We should be able to determine our actual cost and selling price of parts and accessories as established by the net price to servicing organizations from the manufacturer with our legitimate overhead and sales expense added. Much of the work that we are endeavoring to do can certainly be accomplished by sincere cooperation in the local organizations such as the Refrigeration Service Engineers' Society provides, if conducted in accordance with the Constitution and By-Laws as established by the National organization.

"I find that as regards acquainting the general public with my service, the following methods of business solicitation have been most successful, being listed in the order of their importance: direct mail advertising, newspaper ads in season, and personal solicitation. Most of our business thus far has come from our listing in the telephone directory, but I am pleased to report that our individual business is increasing through the recommendations of satisfied users of our service. In our particular instance, we have found it profitable and advisable to service all household electrical appliances, and because of the development of this particular part of our business, we are considering acting as a sales agency for these appliances."

### Another from Missouri

"Fourteen years ago, to the best of my recollection, I was responsible for the installation of the first domestic electric refrigerator in our city. It was a Kelvinator with the unit in the basement. Since that time, refrigeration in our locality has made much progress and, of course, has experienced a number of changes, but the servicing of equipment very few.

"Our electric power company is the largest seller of refrigerators in this community, and I believe their sales are some seven out of ten refrigerators sold. Last summer,

they employed seventeen service men in their refrigerator repair department. Through the off-season, all but four of these men were absorbed in other departments—the four remaining throughout the year in the service department. These seventeen men were paid by the month — the majority receiving $60.00, some $80.00, two $90.00, and the top $120.00. As, of course, they service the boxes that they sell with cheap labor, it can be readily seen that they would command a considerable portion of the servicing work.

"There are eleven other dealers selling domestic units in our community, and each of these dealers keeps a service man to service his units. The establishment of the recognized servicing organization has not been as rapid in our city as in other communities, which can be traced directly to several factors that enter into the picture.

"In a community of some 80,000 people with about twelve sales organizations employing service men, it may be that this market is amply taken care of as far as service is concerned by the number of men engaged in this business, and this may also account for the fact that many of them are not receiving a fair return for their work, and as a consequence, some of them are required to look to other lines to increase their earnings. The trouble with the independent servicing organization in our community is their inability to carry a fairly representative line of replacement parts because of the outlay of cash required, and when Mrs. Housewife calls for service, she wants it immediately and no excuses that parts are not immediately available, so consequently, if the independent service organization is not prepared to take care of these calls promptly, the call immediately goes back to the power company. I have watched the endeavors of some independent service companies to come into our locality, but with very little success. A plumbing shop keeps two repair men, but they are kept busier helping the plumber than servicing refrigerators. Similarly, a large used equipment store has a repair man, but his time is devoted more often to repairing stoves and washing machines. I firmly believe that the independent service man who has the capital, can give prompt service and knows his stuff will be successful in establishing himself in a very profitable way. It will be no easy matter, but will take considerable effort and publicity to inform buyers of refrigeration service where he is and what he can do.

"From our experience, we have found that newspaper advertising has helped out business considerably, but, of course, it is also the most expensive. My suggestion as to the best help for the independent (and I know of nothing better that will contribute to his success faster) is some way in which he can carry a representative stock of supply parts without tying up too much capital. Let us realize that refrigeration service is a commodity that must be handled fast, and naturally, the stock moves only when the refrigeration demand is greatest, which is during the summer months."

## NEW KARLBERG VALVE

THE Karlberg discharge valve, which can be used for any make compressor has just been announced by the Trico Compressor Service, Chicago. The simplicity and sturdiness in the construction of this valve makes it especially easy for the service man to install, as there is no lapping or fitting to be done because of the fact that the valve is self-reseating.

KARLBERG DISCHARGE VALVE

The manufacturer claims that by the use of this discharge valve, the compressor will work more efficiently because the revolving disc in the valve makes the seat perfectly smooth as no grooves become worn as frequently happens when discharge valves of the older type are used.

Full information regarding these discharge valves may be obtained by writing the manufacturer.

The Trico Compressor Service also manufactures the Karlberg Seal Unit which can be fitted to practically any make or model of compressor.

*The* REFRIGERATION SERVICE ENGINEER

A Monthly Illustrated Journal, Devoted to the Interests of the Engineer Servicing Refrigeration Units, Oil Burners and other Household Equipment.

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*Official Organ*
REFRIGERATION SERVICE ENGINEERS' SOCIETY

## TIME IS MONEY

THE most profitable item the refrigeration service organization sells is time. The value of this commodity is determined by the amount of productive time in every hour.

It is unfortunate that apparently the purchaser of refrigeration service has no conception of the value of servicing time. Possibly the service man is at fault. Naturally, these non-productive calls are usually greatest during the busy servicing season when such service time can be most profitably employed.

Every service organization is acquainted with this unfortunate condition. How many times have three or four servicing organizations been called upon to furnish an estimate on a small household job that usually requires a minor repair? It is certain that only one concern will be favored with the job, and we have the condition of two or three men spending their time in furnishing an estimate with a consequent loss of several productive service hours.

In the interests of the servicing business, this condition must be rectified. It has been satisfactorily solved in many localities and the plan has worked out satisfactorily. On receipt of a call to furnish an estimate to "look over" the box and find out why it is not operating, the person making the call is informed that a service charge will be made for this inspection and recommendation for the work necessary. This charge, the consumer is informed, will be rebated if the organization secures the work.

This method has been successful in stopping the loss of time on these "estimate" jobs. Of course, this system has worked best in the smaller cities where the servicing organizations have cooperated as a unit, and it can be said that this method is also making headway in the larger cities where because of the distances often traveled, the cost of such "estimate" calls have been much greater.

## THE R.S.E.S. CONVENTION

PLANS are progressing for the holding of the second Annual Convention of the Refrigeration Service Engineers' Society in Detroit on October 23, 24 and 25. Last October, the first annual convention of service men ever called was held in Chicago, and the representation from many distant points of the country was a most gratifying indication of the interest of the men engaged in this business in establishing it on a stable basis. This convention provided the opportunity of men meeting from various localities and discussing mutual problems that are of importance in the progress of the servicing business.

Since the last convention, the Refrigeration Service Engineers' Society has progressed—has extended the scope of its operations through the increasing of local chapters, and the activities of the organization as a whole. All indications and reports forecast a most important second convention. The program has been arranged to be of interest to every service man, including the presentation of educational papers and discussions by leaders in the field, with actual visits to refrigerating appliance manufacturing plants.

Another departure this year is the manufacturers' exhibit, which will include displays by manufacturers and jobbers.

Every service man is invited to attend this convention whether a member of the organization or not.

## REFRIGERATION SERVICE ENGINEERS' SOCIETY

**Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.**

**THE OBJECTS OF THE SOCIETY**

To further the education and elevation of its members in the art and science of refrigeration engineering; with special reference to servicing and installation of domestic and small commercial equipment; for the reading and discussion of appropriate papers and lectures; the preparation and distribution among the membership of useful and practical information concerning the design, construction, operation and servicing of refrigerating machinery.

**ASSOCIATION HEADQUARTERS: 433-435 North Waller Ave., CHICAGO, ILL.**

# Plans Being Pushed for 2nd Annual R. S. E. S. Convention

THIS is the time of the year that practically everywhere we look we see alluring pictures and graphic descriptions of one-thousand-and-one places where vacation days might be spent. No denying we're in the midst of vacation weather—vacation weather for most everyone, with one notable exception—the refrigeration service man.

This summer weather has only one significant meaning for him—"Make hay while the sun shines"—but we'll have our day.

It is the 2nd annual convention of the Refrigeration Service Engineers' Society at Detroit, planned for the time of the year which will be most convenient for the service business and yet an ideal time to enjoy vacation weather—October 23, 24 and 25.

### Detroit Bids You Welcome

Detroit, centrally situated, and with many inducements of interest to service men, represents an ideal city not only for a respite from an active servicing season, but an unequaled opportunity to visit and see many refrigeration products being manufactured, for which Detroit is so well-known.

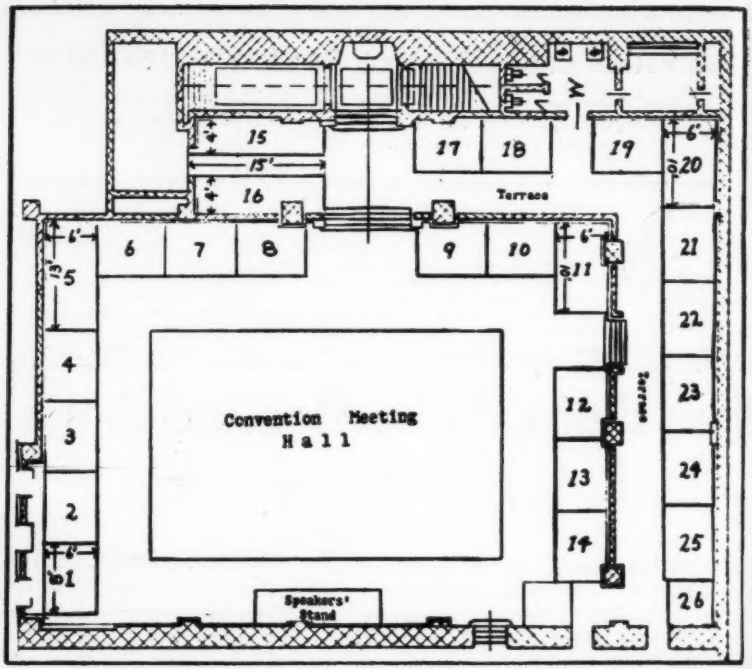
### Program Committee Hard At It

Not frequently is the opportunity offered to combine business with pleasure. The three-day October convention will represent an intensive three-day post graduate educational course for every service engineer. Morning sessions will be devoted to the presentation and discussion of educational papers, and suffice it to say that these presentations will be made by the leading authorities in their respective fields. The afternoon sessions will be devoted to visiting the various manufacturing plants, which the Program Committee is now arranging.

The evenings — well, the Entertainment Committee is planning to make these events ones that you will fondly remember Detroit for a long, long time. Mr. Evan L. Hughes is chairman of the Entertainment Committee.

### And the Ladies, Too!

The Second Annual R.S.E.S. Convention call contains just as cordial an invitation to the ladies. Be assured that their time will be interestingly occupied while the business of the Refrigeration Service Engineers' Society is being conducted. Mrs. Joseph Oberc of Detroit is chairlady of the Women's Enter-




FLOOR PLAN OF CONVENTION MEETING ROOM AND EXHIBITS

tainment Committee. So, there will be something for all.

Now is the time to plan for this Detroit Convention trip. Every service man interested in this business will want to take advantage of attending this meeting.

### Official Hotel

The official hotel and convention meeting place is the Fort Shelby Hotel. Special arrangements have been made to handle the guests of the R.S.E.S. Convention. The convention meeting and exhibits will be held in the Spanish Room.

### Exhibitors' Displays

This year an added feature of the Convention is the exhibit of refrigeration accessories and appliances. Here leading manufacturers and jobbers will display their products which will add to the educational value of the convention.

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## CHICAGO CHAPTER

### Meeting of June 11

By HARRY D. BUSBY, Secretary

PRESIDENT JACOBSEN disposed of the usual business of the meeting and introduced Mr. Hoyland of the Dayton Belt Co., who was a visitor for the evening.

A motion was made by Mr. Goldberg that we give up our present meeting hall and hold our meetings in the future at the Majestic Hotel. Mr. Fred Roth seconded the motion and it was duly carried. Mr. Goldberg pointed out that he had investigated this hotel and the manager has promised us all the facilities of an association headquarters and this would be a more central location for all the members. A general discussion of the matter showed everyone to be heartily in favor of the move.

Mr. Goldberg reported further that a stag is being planned which probably will be held


**CONVENTION HEADQUARTERS, SECOND ANNUAL R.S.E.S. CONVENTION, OCTOBER 23, 24 AND 25. HOTEL FORT SHELBY, DETROIT, MICH.**

about thirty days from date and asks that more cooperation in the purchase of tickets and general help be forthcoming from the members. The entertainment as yet is not definitely arranged for but he will endeavor to secure music, entertainers and possibly a movie.

### Meeting of June 25

The business of this meeting was devoted principally to the dedication of our new quarters in the Majestic Hotel.

The members expressed their approval of our new quarters and a grand time was had by all with the aid of suitable refreshments and plenty of sandwiches. Good fellowship reigned supreme.

\$ \$ \$

## PITTSBURGH CHAPTER

### Meeting of June 10

By F. V. GOLITZ, Secretary

THE meeting was held in the Corporation Room of the Commonwealth Building. Through the courtesy of Mr. Hurst of the Commonwealth Realty Company, the room was made available to the society without charge.

President McCauley called the meeting to order and the minutes of the previous meeting were read by the Secretary. Minutes were accepted as read.

President McCauley read the correspondence regarding the work of the Cost Records Committee.

The results of the election were:

Chairman of Educational Committee—H. S. McCloud.

Board of Directors—Wesley M. Barnes, H. S. McCloud, R. F. McCormick.

President McCauley appointed F. V. Golitz as Chairman of the Entertainment Committee.

Business meeting closed.

Mr. J. W. Dorris of the Danforth Company, Westinghouse distributors, gave an instructive talk on "Service Problems" which was well received by the members.

Meeting adjourned.

\$ \$ \$

## NEW YORK CHAPTER

### Election of Officers

ANNOUNCEMENT of the election of officers of New York Chapter was made at a dinner at the roof garden of the St. Moritz Hotel attended by the members of New York Chapter, which also featured some excellent entertainment enjoyed by all of the members.

The members were notified in advance of the meeting of the selections by the Nominating Committee for the various offices of New York Chapter and the ballots mailed to them at that time with instructions for the selection of the officers for the coming year. While the names given in the ballot were the recommendation of the Nominating Committee, it was the privilege of any member to vote for any other member not listed on the official ballot. The balloting was closed on June 30 and the following officers were unanimously elected:

President—Mr. G. Busse.

First Vice-President—J. A. Rohrer.

Second Vice-President—T. A. Reina.

Treasurer—E. J. Merenda.

Secretary—Harold Herkimer.

Sergeant-at-Arms—J. Check.

Board of Directors—H. F. Hanson, A. E. Crossland, E. C. Hillard, O. W. Smith.

Mr. Busse, the new president, is a graduate mechanical engineer and is in the contracting and service business in New York City, specializing in methyl chloride, sulphur dioxide and Freon units. Mr. Busse has been one of the active members of New York Chapter.

Mr. Rohrer, first vice-president, has been in the refrigeration business for the past fifteen years and was formerly general manager of the Oriole Company of Baltimore. He is at present engaged in the installation of York Freon and methyl chloride units, as well as an installation contractor for the Hussman Company of Ligonier, Indiana.

Mr. Reina, second vice-president, is a partner in the M & R Refrigeration Service Company, which is one of the representative service companies in Brooklyn.

Mr. Merenda, treasurer, is well known to a large number of the members of the National Organization of the R. S. E. S., having served as its National Treasurer since the formation of the Society.

Mr. Check, sergeant-at-arms, has an independent service company and his business is well established in the Bronx.

Mr. Herbert Herkimer, active in the formation of the national society and its first national president as well as New York Chapter, has been elected as chairman of the Board of Directors and Advisor of New York Chapter. Mr. Herkimer is well known for his energetic and sincere work in conjunction with the progress of the National Organization.

The newly elected officers are desirous of carrying out the ideals of the Society and furthering the progress of New York Chapter, and from time to time will have interesting news for the readers of this column.



## CHICAGO CHAPTER CHATTER

By HERMAN GOLDBERG

HEAR Ye! Hear Ye! Hear Ye! Chicago Chapter has moved its headquarters from the hall at 2111 Jackson Blvd. to the Majestic Hotel at Quincy St. near State St. in the loop.

The effect at the first meeting was positively surprising, as the boys seem to have found their tongues again.

The smoker and stag will be held on July 23rd in the Sky Room of the new headquarters, and the entertainment committee expects at least 300 members and visitors at this affair. This is going to be *some* party.

And also, because we don't want the wives of the members to feel slighted, this committee is now making arrangements for a ladies' party for either the latter part of August or the early part of September.

These affairs are calling for a lot of hard work and a lot of credit should be given to our good friend, Clarence Hamilton, of the educational committee, for not only putting a lot of time in at the meetings but for taking a lot of time during his regular working hours to help put the R. S. E. S. over.

I had occasion to make a visit to Detroit a couple of weeks ago. The few boys I saw up there seem to be cheerful and I especially got a kick out of the visit I had with my namesake, Joe Oberc. He is certainly going places and the Detroit boys are fortunate to have a man of his caliber belonging to their organization.

Incidentally, you can't afford to miss the coming convention in Detroit, as from what I saw while I was there, it is going to be one of the greatest things in the country for the refrigeration service men.

As usual, I must close, but keep on shooting material to me at my office, 5101 W. Madison St., or phone me at Austin 6343.

## THE UNIVERSAL DOMESTIC COMPRESSOR

*(Continued from page 13)*

the tube and causing the cold or frost. Flush the float valve. If this does not cure the trouble, the float valve will have to be changed. If after checking the probable causes just described, the difficulty is not found, there is a probability that the flapper valve is leaking, thereby decreasing the efficiency of the compressor to the point where poor refrigeration is obtained. Check the flapper valve. The final test to be made, if all others fail to show the difficulty, is that for compressor efficiency. Close the suction line valve and pump a vacuum on the oil case. If the compressor is inefficient, it will be impossible to draw a good vacuum.

B. Cabinet too cold.

Since the refrigerator is too cold, there is apparently no difficulty in the refrigerant circuit and the cause must be elsewhere. The thermostat governs the cabinet temperature and it is evident that this is out of adjustment or has failed to function. Examine and adjust or replace.

**Compressor Does Not Run Much, Cooling Coil Is Defrosting**

The diagnosis of this problem is similar to the preceding one. The refrigeration is insufficient. There cannot be a shortage of $SO_2$ in the system because this would cause

*(Continued on page 36)*

the compressor to run continuously, and the complaint specifically states that it does not run much. The difficulty must, therefore, be in the thermostat which is set too warm or is out of adjustment. Check this and correct the difficulty.

### Compressor Will Not Run

This is caused by an interruption in the supply of electric current to the motor. A burned-out fuse or a failure in the thermostat will cause this. Check the fuses and if burned out, replace. If this fails to start the motor, examine the thermostat overload protector, contacts and mechanism which includes the bellows of the bulb assembly. Repair or replace anything found defective and should these operations not remedy the difficulty, a further search for electrical trouble will be necessary.

### Freezes Ice But Food Spoils

Food spoilage indicates a lack of refrigeration. However, since ice freezes, there cannot be lack of refrigeration, and it is necessary to check to see why the heat from the food is not being absorbed by the cooling coil. There is only one reason for this condition—lack of air circulation. Too much food has been placed on the shelves, or if the cabinet has a baffle, food is obstructing the opening. Paper may have been spread over the shelves by a conscientious housewife, thus stopping circulation. Instruct the user on proper circulation and placing of food.

### Radio Interference

This is usually caused by other outside interference. Operate the radio with the unit running and have the user point out the interference. Then stop the compressor and if the interference still exists, it is caused by some outside equipment such as a vacuum cleaner, washing machine or electrical device employing a commutator type motor. Interference is caused by the sparking of the brushes. If the motor on the Universal uses D.C. current, an eliminator is necessary. If the motor is the usual A.C. repulsion-induction type no interference will be found if the brush mechanism, commutator and brushes are clean and functioning properly.

### Overload Protector Throws Out

This symptom indicates that there is either too much air or gas in the system, a stiff compressor or that there is electrical trouble. Check the head pressure and if too high, purge air from system or discharge an excessive amount of gas. Next, check with an indicating wattmeter the motor input and determine if the trouble is electrical.

### Odor of Gas Is Noticed When Compressor Stops

By reviewing the cycle of operation, we find that there is always pressure on the high side while a vacuum is recorded on the low side at times. As the odor of gas is detected only when the unit stops, it is evident that the leak is on the low side. Stop the compressor and test all joints on the low side. This includes flare nuts, sylphon seal, gaskets, etc. Also check for sand hole leaks through the castings themselves. Some low side leaks are extremely hard to locate. Do not fail to find and correct the condition. It will prevent more serious trouble later.

## PREVENTING OIL TRAPPED SUCTION LINES

*(Continued from page 22)*

can be used to provide proper oil return. When this method is used, the suction line should be sloped to a point close to the condensing unit, at which point the "U" shaped bend should be made. When condensing units are located above the top of the refrigerator, as illustrated in Fig. 6 and 7, the "U" shaped trap should be made in the suction line outside the refrigerator and the suction line from the evaporator should slope to the trap. The suction line then runs vertical to the compressor.

SUCTION AND LIQUID VALVE TABLE
(Methyl Chloride, $SO_2$, F-12)

| SUCTION VALVE | LIQUID LINE | HORSEPOWER |
|---|---|---|
| ⅜ Tube | ¼ | ¼-½ |
| ½ Tube | ¼ | ½-¾ |
| ⅝ Tube | ¼ | 1-2 |
| 1" Pipe | ⅜ | 3-5 |
| 1 ½" Pipe | ⅝ | 7½-15 |

In case of doubt use next size larger.

When the condensing units are located above the fixtures, the maximum vertical height of the suction line from the "U" shaped trap to the valve connection must not exceed 25 feet.

This method can also be used where refrigerant lines are buried in the floors, provided the suction line is sloped from the evaporator to a pit in the floor adjacent to the condensing unit. See Fig. 5. The pit is provided for the trap in the suction line.

In operation, the "U" shaped trap fills with oil and the evaporator pressure, aided by the suction of the compressor, forces the oil from the trap into the crankcase.

# Want *Information*?

## Use The R. S. E. SERVICE DEPARTMENT

### —It's for Your Convenience

THIS department is conducted for the convenience of our subscribers. We will ask the manufacturers and distributors to send you the latest information on the items checked.

- ☐ Belts
- ☐ Blow Torches
- Blowers (see Unit Blowers)
- ☐ Books
- ☐ Brushes, Motor
- ☐ Bushings, Motor
- ☐ Carbon Tetrachloride
- ☐ Charging Hose
- ☐ Charging Stand
- Coils
  - ☐ Fin
  - ☐ Pipe
- ☐ Compressors
- Condensers
  - ☐ Air Cooled
  - ☐ Water Cooled
- ☐ Condenser Water Regulators
- ☐ Connecting Rods
- Controls
  - ☐ Cold
  - ☐ Humidity
  - ☐ Liquid Level
  - ☐ Pressure
  - ☐ Temperature
  - ☐ Thermostatic
  - ☐ Water
- ☐ Domestic Evaporators
- Dehydrants
  - ☐ Activated Alumina
  - ☐ Calcium Chloride
- ☐ Dehydrators
- Door Seals (see Gaskets)
- ☐ Drums, Service
- ☐ Dryers
- Evaporators
  - ☐ Dry
  - ☐ Flooded
- ☐ Fan and Pulley Assemblies
- Filters (see Strainers)
- ☐ Float, High Side
- ☐ Float Valve Seats
- Fittings
  - ☐ Flared
  - ☐ Streamline
- Gaskets
  - ☐ Compressor
  - ☐ Door
- ☐ Gasket Material
- ☐ Gasket Tackers
- ☐ Goggles
- ☐ Gauges, Service
- ☐ Hardware, Refrigerator
- ☐ Leak Detectors
- ☐ Lapping Compound and Materials
- ☐ Liquid Indicator
- ☐ Lubricating Oils
- ☐ Low Side Float Switches
- ☐ Low water
- ☐ Motors
- ☐ Needles, Float Valve
- ☐ Oil Return
- Packing
  - ☐ Fabric
  - ☐ Metallic
- ☐ Piston Pins
- ☐ Piston Rings
- ☐ Porcelain Refrigerator Cement
- ☐ Pumps, Circulating
- ☐ Receivers
- Recording Instruments
  - ☐ Humidity
  - ☐ Running Time
  - ☐ Temperature
- Refrigerants
  - ☐ Sulphur Dioxide
  - ☐ Methyl Chloride
  - ☐ Carrene
  - ☐ Freon
  - ☐ Iso Butane
  - ☐ Ethyl Chloride
- Refrigerator Dishes
  - ☐ Glass
  - ☐ Porcelain
- ☐ Safety Masks
- ☐ Seals, Shaft
- ☐ Resurfacing Stones
- Strainers
  - ☐ Expansion and Float Valve
  - ☐ Liquid Line
  - ☐ Suction Line
- Switches
  - ☐ Air Temperature
  - ☐ High Pressure Control
  - ☐ Low Pressure Control
  - ☐ Pressure
  - ☐ Temperature
- ☐ Mercury
- Thermostats
  - ☐ Air Temperature (Cooling)
  - ☐ Air Temperature (Heating)
  - ☐ Brine
  - ☐ Domestic Refrigeration
  - ☐ Industrial Refrigeration
- Thermometers
  - ☐ Refrigerator
  - ☐ Test
- ☐ Tool Chests
- Tools
  - ☐ Flaring
  - ☐ Pinchoff
  - ☐ Tube Bender
  - ☐ Tube Cutter
  - ☐ Wrench Sets
- ☐ Trap, Scale
- ☐ Trays, Ice Cube
- Tubing
  - ☐ Copper
  - ☐ Finned
  - ☐ Steel
  - ☐ Tinned
- ☐ Unit Blowers
- Valves
  - ☐ Automatic Expansion
  - ☐ By Pass
  - ☐ Check
  - ☐ Compressor
  - ☐ Expansion
  - ☐ Flapper
  - ☐ Magnetic
  - ☐ Pressure Reducing
  - ☐ Shutoff
  - ☐ Solenoid
  - ☐ Thermostatic Expansion
  - ☐ Two-Temperature
  - ☐ Water
- ☐ Valve Retainers
- ☐ Valve Stems

**Write in Names of Products Not Listed**

Name .....

Address .....

City and State .....

Business .....

Mail This Page to the

**Refrigeration Service Engineer 433 N. Waller Ave., Chicago, Ill.**

# *You Are Invited . . .*

to participate in
the activities of the

## REFRIGERATION SERVICE ENGINEERS' SOCIETY

*Initiation Fee*
*$2.50*
*Annual Dues*
*$5.00*

an educational engineering association to further the advancement of the refrigeration servicing profession.

This national organization of service men comprising the representative service men throughout the country is organized to serve its membership by keeping them currently informed on the advancement and developments in mechanical refrigeration.

It also provides an active organization which at all times represents and works for the best interests of the profession throughout the country.

If you are actively engaged in this profession, identify yourself with the organization which represents your interests. We suggest you write to National Headquarters for complete information as to how this Society is serving its membership.

# *A Local Chapter . . .*

in your city. The National Society will aid in the formation of a local chapter. Ten or more active service men are required to form a chapter. The National Society will assist.

---

**NATIONAL HEADQUARTERS,**
**REFRIGERATION SERVICE ENGINEERS' SOCIETY,**
**433 N. Waller Ave., Chicago, Ill.**

Check one or both ☐ Please send me information regarding membership in the Society.
☐ I would like to have further information as to the formation of a local chapter in my city.

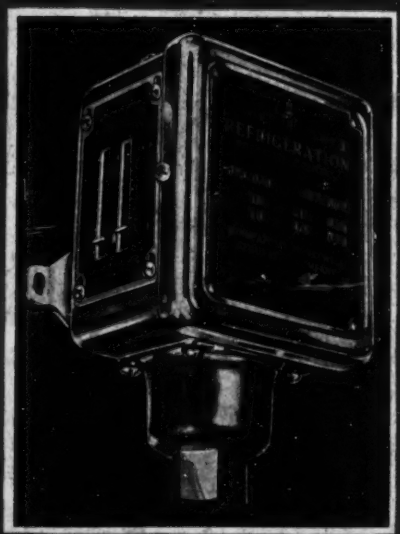
Name .....

Address .....

City and State .....

# MERCURY SWITCHES ARE BEST

## for REFRIGERATION CONTROL



For line voltage controls, such as u on refrigerating equipment, there nothing better than mercury switches. Minneapolis-Honeywell has long be the largest manufacturer of open cont switches. Yet with either type to choo from, our engineers unanimously sel Con-Tac-Tor Mercury Switches for Min apolis-Honeywell Refrigeration Contro because of their many exclusive featu and twenty years of successful applicati Minneapolis-Honeywell Regulator Co pany, 2934 Fourth Avenue South, Min apolis, Minnesota. Branch or distributi offices in all principal cities.

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